Goddard Space Flight Center

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GSFC

Basic Concepts of Point Counting

August 22, 2005

August 25, 2005

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Software Process Improvement (SPI) Project

Purpose and Objectives

- **Purpose: This presentation will acquaint you with the concept of Point Counting for objective schedule status assessment.**
- **Objective - After this class you should understand:**
  - **What Point Counting is**
  - **What Point Counting data can tell you**
  - **Why you should use it**
  - **The concepts of planning your Point Counting**
  - **The concepts of tracking progress using Point Counting**
  - **What records should be kept in the Point Counting process**
  - **Possible pitfalls in Point Counting**

This presentation covers basic concepts. See "Making Point Counting Work for You" for information on how to apply point counting.

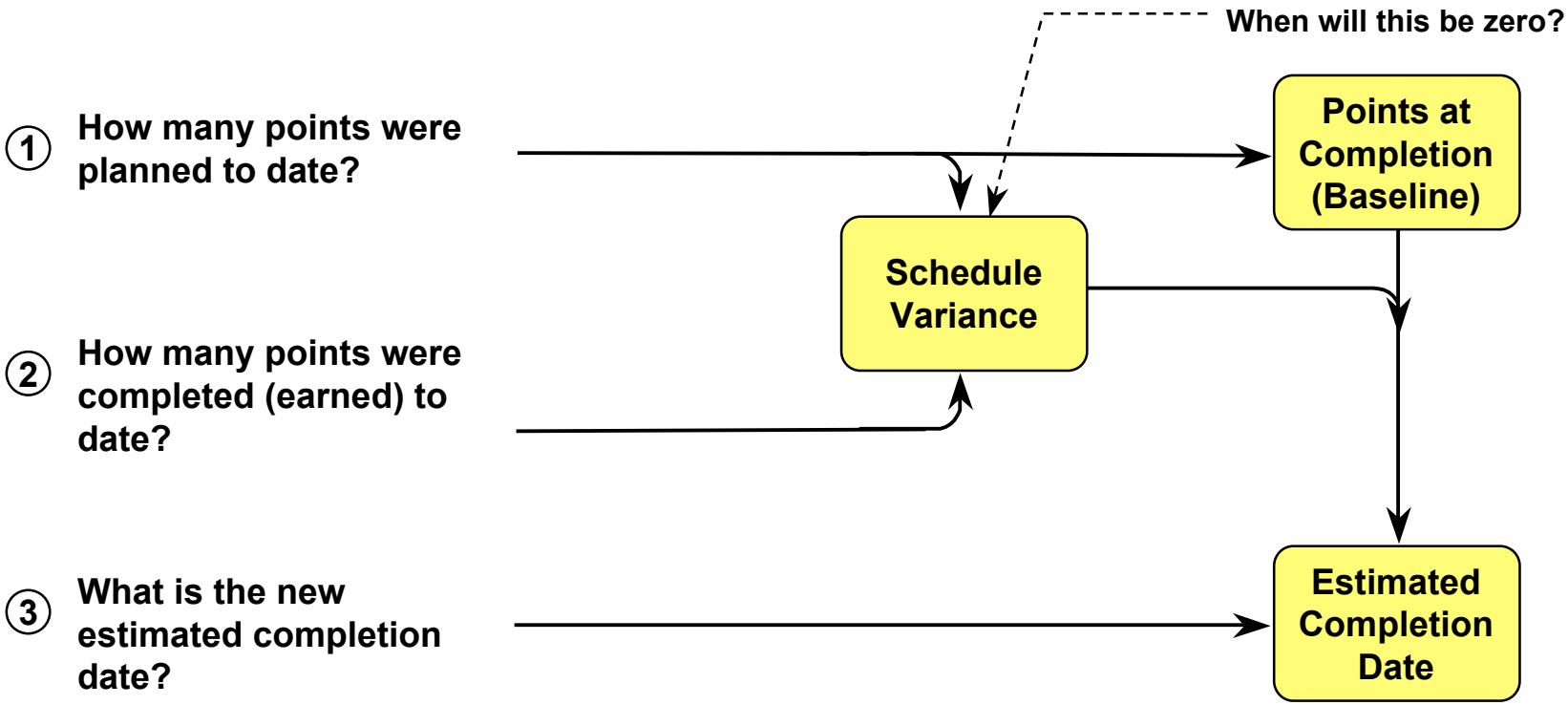
What is Point Counting?

Point Counting - a process that captures a plan for accomplishing work and provides an objective view of progress against that plan

- Based on assigning "points" to each activity
- Points assigned based on the effort planned
  - The goal is to make point units equal to "staff days"
  - For example, an activity planned to use 10 staff days is assigned 10 points
- Similar to earned value methodology, but may not capture actual resources used

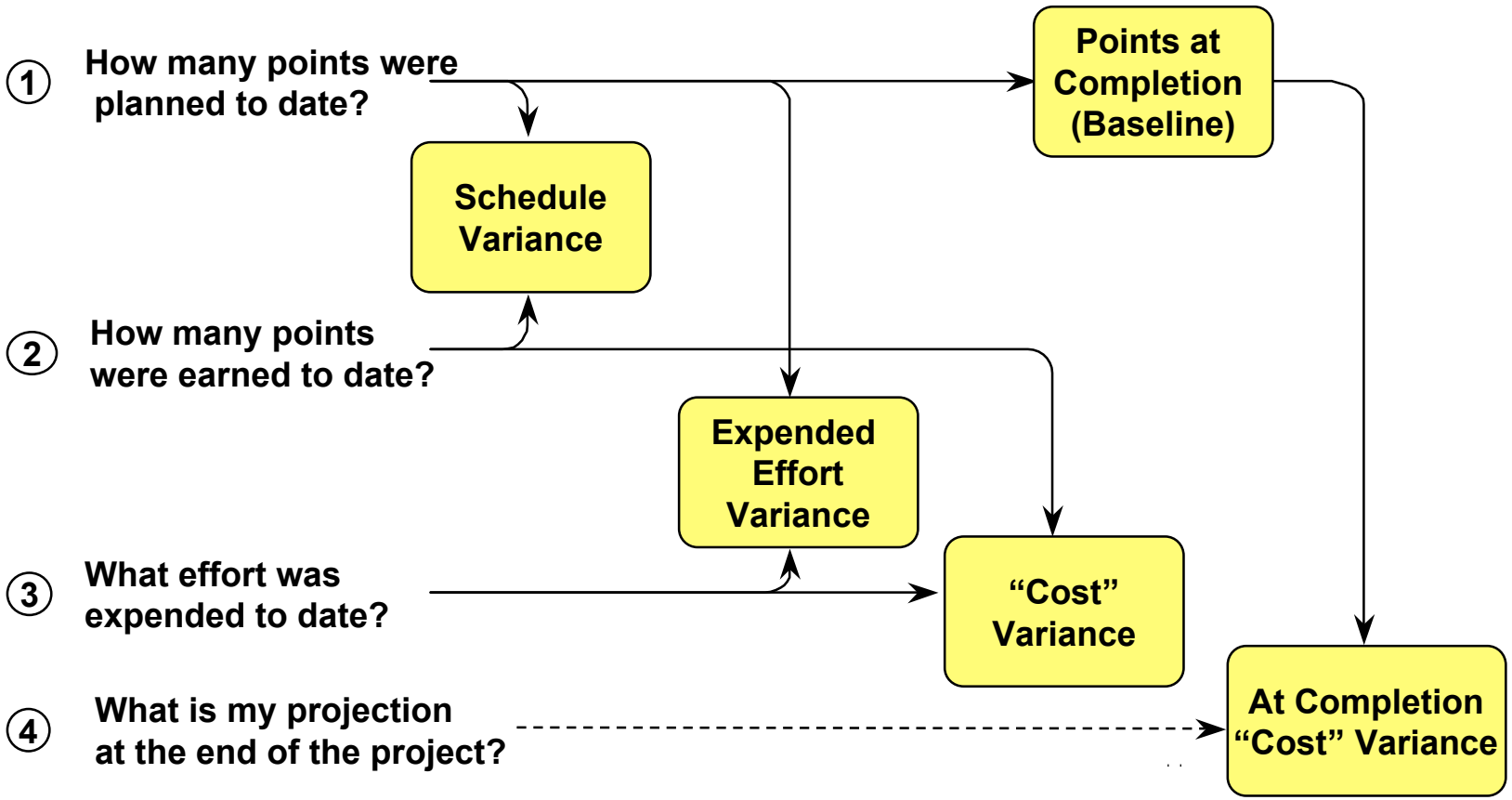
Point Counting Schedule Data

It provides the ability to *quantify the answers* to the following questions and *understand the variance* between the answers



Point Counting Data With Effort (Earned Value)

Extends the ability to *quantify answers* and *understand variances*



Why Use Point Counting?

- Supports insight into progress and team performance
- It supports quantitative measurement of what you've accomplished (your "earned value")
- It supports quantitative reporting of your schedule status
- It supports an analysis of any schedule variance and forecasting of any impact
- Provides data for improved estimate to complete
- It allows corrective action in time to prevent the "crisis" or to minimize the impact of the crisis

Point Counting for Software Projects

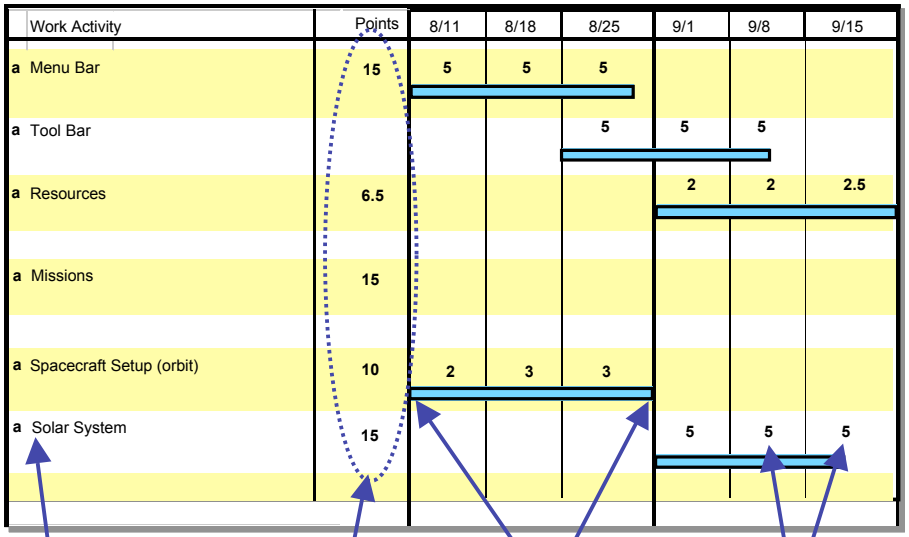
- Software projects have many opportunities to apply point counting to track progress effectively because…
  - Software products are typically made up of numerous software components
  - Software activities are typically staged or phased with numerous, but similar work products for each stage
  - Verifications are typically part of the process (they define objective criteria for "completing an activity")
- Software activities with groups of similar products
  - Reviewing requirements
  - Writing test procedures
  - Developing code units (design, code, unit test)
  - Executing tests
  - Implementing change requests (maintenance)

Begin With Detailed Planning of the Work

- Identify short-duration packages of work within the task to be measured
  - Try to keep each activity to 2 months or less in duration
  - Sometimes the work packages in a group are "equivalent" in effort – each is worth same number of points (e.g., coding 10 similar units)
  - Otherwise estimate the "weight" of the work packages knowing what their total is (e.g., total document takes 10 staff days, document outline is 10%, draft is 60%, final is 30%)
- Identify completion or verification criteria for each package (e.g., code inspection, outline review, completed test matrix)
- Schedule start and end date of each work package (e.g., each unit code, unit test, document outline)
- Assign points (effort in staff days) to each work package
  - Based on historical information (models), make reasonable estimates of effort and schedule of these sub-elements
  - Make your best estimate based on best available information

The Detailed Planning

- **Create the detailed schedule with resource allocation for each work element**
  - **Activity**
  - **Start and End Date**
  - **Points (staff days)**



- **Move data into a spreadsheet for ease of use**

Activity	Points	Start Date	End Date
a Menu Bar	15	08/04/03	08/22/03
a Tool Bar	15	08/18/03	09/05/03
a Resources	6.5	09/01/03	09/19/03
a Missions	15	09/19/03	10/09/03
a Spacecraft Setup (Orbit)	10	08/04/03	08/26/03
a Solar System	15	08/25/03	09/12/03

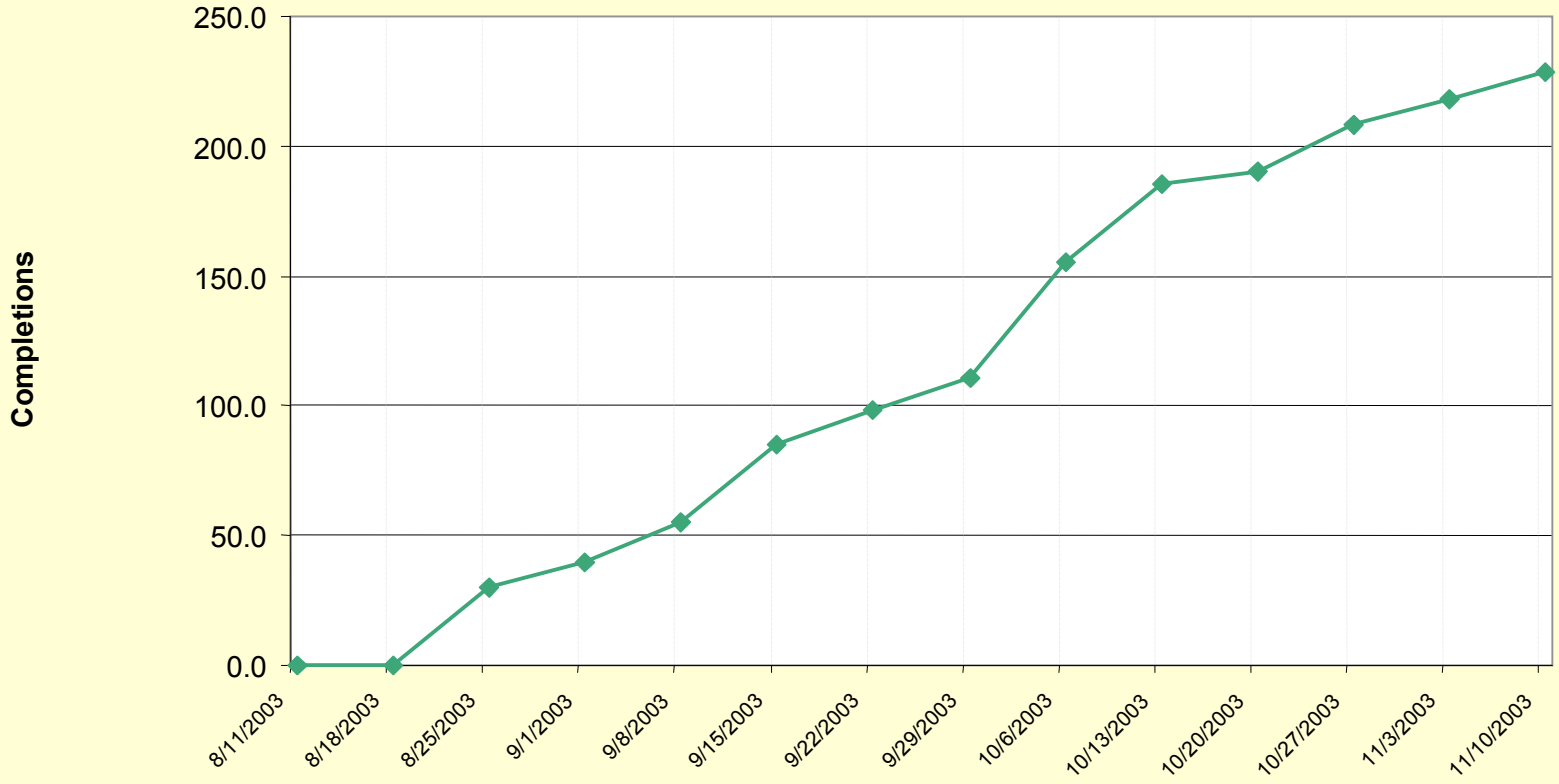
Example Point Counting Plan

Group	Task	Points	Start	Planned Finish	Actual Finish
	Build 1	0			
	GUI Dialogs (Layout)	0			
a	Menu Bar	15	08/04/03	08/22/03	NA
a	Tool Bar	15	08/18/03	09/05/03	NA
a	Resources	6.5	09/01/03	09/19/03	NA
a	Missions	15	09/19/03	10/09/03	NA
a	Spacecraft Setup (Orbit)	10	08/04/03	08/26/03	NA
a	Solar System	15	08/25/03	09/12/03	NA
a	Propagator/Force Model Setup	15	08/04/03	08/22/03	NA
a	Propagate Command	15	08/25/03	09/12/03	NA
	Spacecraft	0			
i	Core Vehicle Class	5	09/15/03	09/22/03	NA
	Propagator Setup	0			
j	PropSetup Class	10	10/20/03	10/31/03	NA
	Propagator	0			
k	Propagator Base Class	5	09/24/03	09/30/03	NA
k	Runge Kutta89 (Verner)	3.75	09/24/03	09/30/03	NA
	StoppingCondition	0			
l	SC Base Class	5	10/01/03	10/07/03	NA
	Small set of Build 1 cond's	0			
m	SingleValueStop	3	10/08/03	10/10/03	NA
	Interpolator	0			
n	Interpolator Base Class	13	10/02/03	10/20/03	NA

Example Point Counting Plan Graph

Sample 2

As of Date Aug-04-2003



	08/11/03	08/18/03	08/25/03	09/01/03	09/08/03	09/15/03	09/22/03	09/29/03	10/06/03	10/13/03	10/20/03	10/27/03	11/03/03	11/10/03
Plan	0.0	0.0	30.0	40.0	55.0	85.0	98.5	110.5	155.3	185.3	190.3	208.3	218.3	228.3
Actual														

Track Progress Based on Your Plan

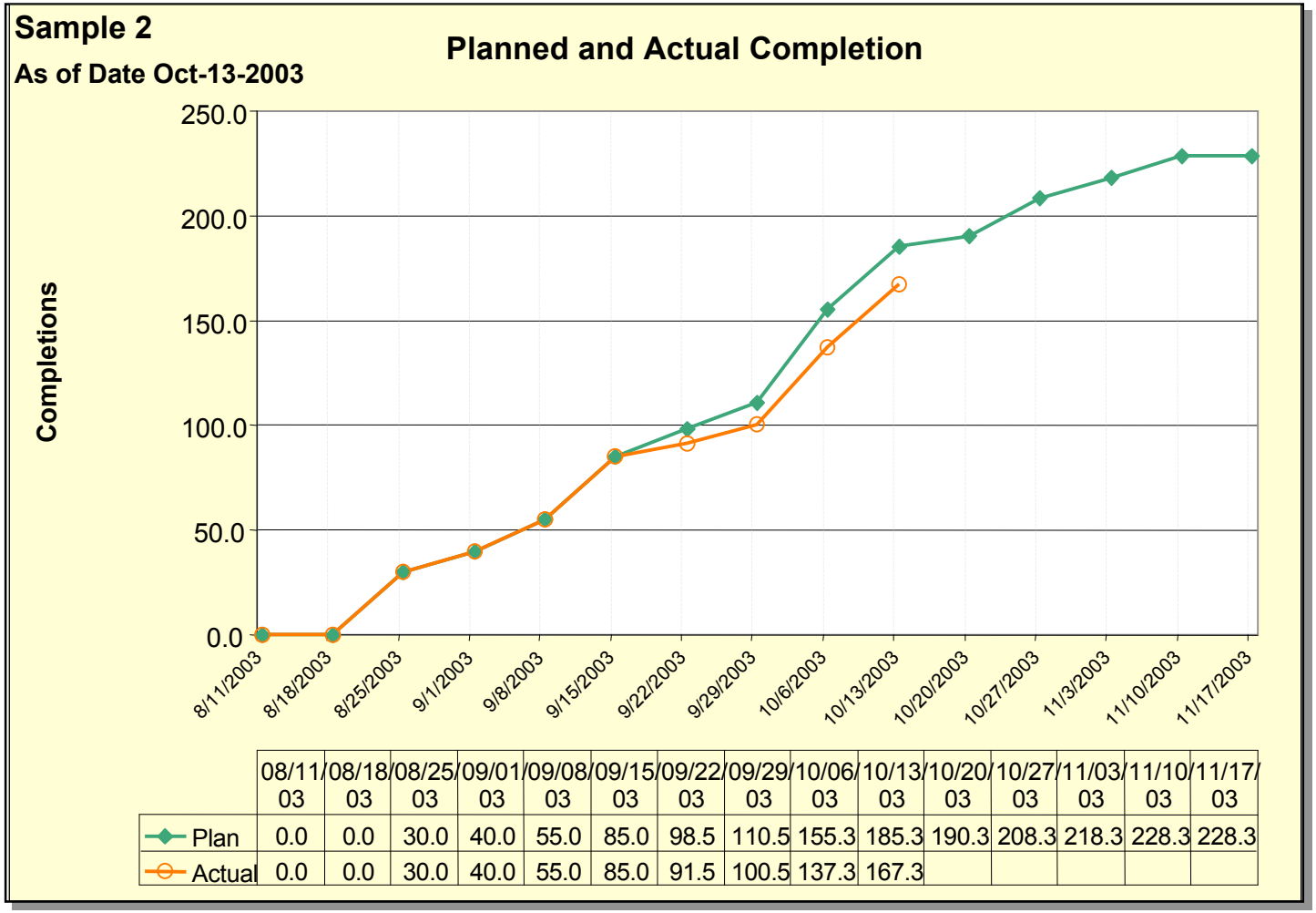
- Credit the points to each work package as it is completed according to the completion criteria
- On a regular basis, compare the cumulative planned points to the cumulative performed (credited) points
- Analyze the results and assess major variances:
  - Why is there a variance?
  - What will the impact be?
  - How can the variance be eliminated?
  - When will you be back to plan?

Example Point Counting Actual Data

Group	Task	Points	Start	Planned Finish	Actual Finish	Points Earned
	Build 1					
	GUI Dialogs (Layout)					
a	Menu Bar	15	08/04/03	08/22/03	08/22/03	15.0
a	Tool Bar	15	08/18/03	09/05/03	09/05/03	15.0
a	Resources	6.5	09/01/03	09/19/03	09/19/03	6.5
a	Missions	15	09/19/03	10/09/03	10/09/03	15.0
a	Spacecraft Setup (Orbit)	10	08/04/03	08/26/03	08/26/03	10.0
a	Solar System	15	08/25/03	09/12/03	09/12/03	15.0
a	Propagator/Force Model Setup	15	08/04/03	08/22/03	08/22/03	15.0
a	Propagate Command	15	08/25/03	09/12/03	09/12/03	15.0
	Spacecraft					
i	Core Vehicle Class	5	09/15/03	09/22/03	09/22/03	5.0
	Propagator Setup					
j	PropSetup Class	10	10/05/03	10/12/03	NA	NA
	Propagator					
k	Propagator Base Class	5	09/24/03	09/30/03	09/30/03	5.0
k	Runge Kutta89 (Verner)	3.75	09/24/03	09/30/03	09/30/03	3.8
	StoppingCondition					
l	SC Base Class	5	10/01/03	10/07/03	NA	NA
	Small set of Build 1 cond's					
m	SingleValueStop	3	10/08/03	10/10/03	NA	NA
	Interpolator					
n	Interpolator Base Class	13	10/02/03	10/20/03	10/20/03	13.0

Insight into progress and team performance

Example Point Counting Accomplishment Graph



	08/11/03	08/18/03	08/25/03	09/01/03	09/08/03	09/15/03	09/22/03	09/29/03	10/06/03	10/13/03	10/20/03	10/27/03	11/03/03	11/10/03	11/17/03
Plan	0.0	0.0	30.0	40.0	55.0	85.0	98.5	110.5	155.3	185.3	190.3	208.3	218.3	228.3	228.3
Actual	0.0	0.0	30.0	40.0	55.0	85.0	91.5	100.5	137.3	167.3					

- *Quantitative measurement of what you've accomplished*
- *Analysis of schedule variance and forecasting of impact*

Check the Spreadsheet for a Variance Source

Group	Task	Points	Start	Planned Finish	Actual Finish	Status
	Build 1					
	GUI Dialogs (Layout)					
a	Menu Bar	15	08/04/03	08/22/03	08/22/03	15.0
a	Tool Bar	15	08/18/03	09/05/03	09/05/03	15.0
a	Resources	6.5	09/01/03	09/19/03	09/19/03	6.5
a	Missions	15	09/19/03	10/09/03	10/09/03	15.0
a	Spacecraft Setup (Orbit)	10	08/04/03	08/26/03	08/26/03	10.0
a	Solar System	15	08/25/03	09/12/03	09/12/03	15.0
a	Propagator/Force Model Setup	15	08/04/03	08/22/03	08/22/03	15.0
a	Propagate Command	15	08/25/03	09/12/03	09/12/03	15.0
	Spacecraft					
i	Core Vehicle Class	5	09/15/03	09/22/03	09/22/03	5.0
	Propagator Setup					
j	PropSetup Class	10	10/20/03	10/31/03	NA	NA
	Propagator					
k	Propagator Base Class	5	09/24/03	09/30/03	09/30/03	5.0
k	Runge Kutta89 (Verner)	3.75	09/24/03	09/30/03	09/30/03	3.8
	StoppingCondition					
l	SC Base Class	5	10/01/03	10/07/03	NA	NA
	Small set of Build 1 cond's					
m	SingleValueStop	3	10/08/03	10/10/03	NA	NA
	Interpolator					
n	Interpolator Base Class	13	10/02/03	10/20/03	10/20/03	13.0

Look for late delivery of activity results in spreadsheet

Allows corrective action in time to avoid late delivery of products

Pitfalls in Using Point Counting

- **Don't put too little detail in the Point Counting plan**
  - **You won't have enough visibility into status**
  - **You won't get the early warning of bad trends**
  - ***Activities should be no longer than 2 months***
- **Don't put too much detail in the plan**
  - **It will take much more effort to create and maintain**
  - ***Most activities should be at least 2 weeks long***
- **Don't change the schedule to match progress – it hides your schedule risks**
- **Don't over-control the plan because you need to respond quickly to changes like added or deleted work**

Keeping Records

Products of the point counting process that should be kept in the project data stores:

- **Point Counting plan in a spreadsheet**
- **Updated spreadsheet version with actual status for each update cycle***
  - **Hint: include the status date in the file name for each update**

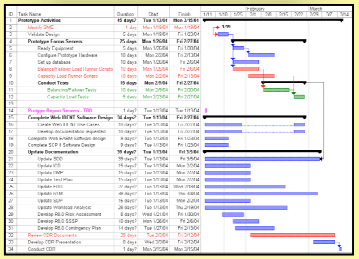
This data is used in status reviews for percent complete, estimate-to-complete, variance reports, and corrective action reporting

The ISD Point Counting Tool

- Use The ISD Point Counting Tool (an Excel spreadsheet) to capture and report data
  - Go to http://software.gsfc.nasa.gov/tools.cfm
  - See asset 1.4.2.1 Point Counting Spreadsheets
  - Experiment with the spreadsheet prior to using it for your progress tracking
- Attend the *Making Point Counting Work for You* presentation for how to use the spreadsheet next month

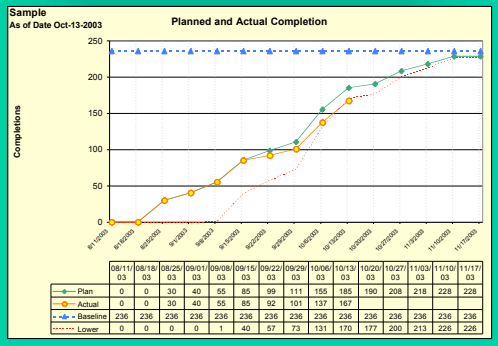
The Tool and Its Output

MS Project Plan



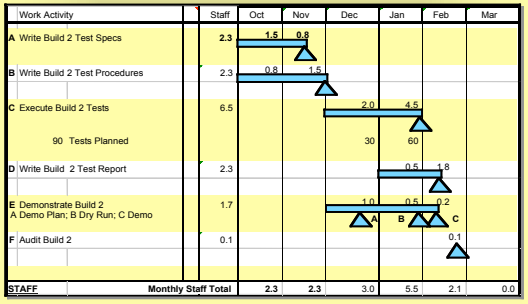
Point Counting Worksheets

The Trend Chart



	08/11/03	08/18/03	08/25/03	09/01/03	09/08/03	09/15/03	09/22/03	09/29/03	10/06/03	10/13/03	10/20/03	10/27/03	11/03/03	11/10/03	11/17/03
Plan	0	0	30	40	55	85	99	111	155	185	190	208	218	228	228
Actual	0	0	30	40	55	85	92	101	137	167					
Baseline	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236
Lower	0	0	0	0	1	40	57	73	131	170	177	200	213	226	226

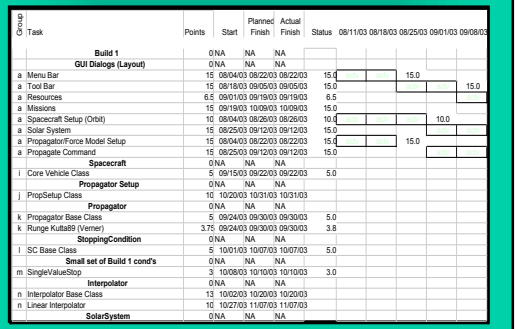
The Detailed Work Plan



The Current Statistics

Points Summary	
Total to Earn	235.75
Total Earned	167.25
Percent Complete	71%
Schedule Summary	
Days in Schedule	105
Days Since Start	70
Percent Schedule	67%
Schedule Variance	-18

Point Counting Status



Group	Task	Points	Start	Planned Finish	Actual Finish	Status	08/11/03	08/18/03	08/25/03	09/01/03	09/08/03
	Build 1	0	NA	NA	NA						
	GUI Dialogs (Layout)	0	NA	NA	NA						
a	Menu Bar	15	08/04/03	08/22/03	08/22/03	15.0			15.0		
a	Tool Bar	15	08/18/03	09/05/03	09/05/03	15.0					15.0
a	Resources	6.5	09/01/03	09/19/03	09/19/03	6.5					
a	Missions	15	09/19/03	10/06/03	10/06/03	15.0					
a	Spacecraft Setup (Orbit)	10	08/04/03	08/26/03	08/26/03	10.0				10.0	
a	Solar System	15	08/25/03	09/12/03	09/12/03	15.0					
a	Propagator/Force Model Setup	15	08/04/03	08/22/03	08/22/03	15.0			15.0		
a	Propagate Command	15	08/25/03	09/12/03	09/12/03	15.0					
	Spacecraft	0	NA	NA	NA						
i	Core Vehicle Class	5	09/15/03	09/22/03	09/22/03	5.0					
	Propagator Setup	0	NA	NA	NA						
j	PropSetup Class	10	10/20/03	10/31/03	10/31/03						
	Propagator	0	NA	NA	NA						
k	Propagator Base Class	5	09/24/03	09/30/03	09/30/03	5.0					
k	Runge Kutta89 (Verner)	3.75	09/24/03	09/30/03	09/30/03	3.8					
	StoppingCondition	0	NA	NA	NA						
l	SC Base Class	5	10/01/03	10/07/03	10/07/03	5.0					
	Small set of Build 1 cond's	0	NA	NA	NA						
m	SingleValueStop	3	10/08/03	10/10/03	10/10/03	3.0					
	Interpolator	0	NA	NA	NA						
n	Interpolator Base Class	13	10/02/03	10/20/03	10/20/03						
n	Linear Interpolator	10	10/27/03	11/07/03	11/07/03						
	SolarSystem	0	NA	NA	NA						

- *Quantitative reporting of your schedule status*
- *Data for improved estimate to complete*

Summary

- Supports insight into progress and team performance
- It supports quantitative measurement of what you've accomplished (your "earned value")
- It supports quantitative reporting of your schedule status
- It supports an analysis of any schedule variance and forecasting of any impact
- Provides data for improved estimate to complete
- It allows corrective action in time to prevent the "crisis" or to minimize the impact of the crisis
- Hints:
  - Use for virtually all project activities; works best with activities of 2 month duration or less
  - Assign points to each activity based on the effort required (staff days to complete)
  - Earn points by meeting the defined completion criteria for each work package

Questions?

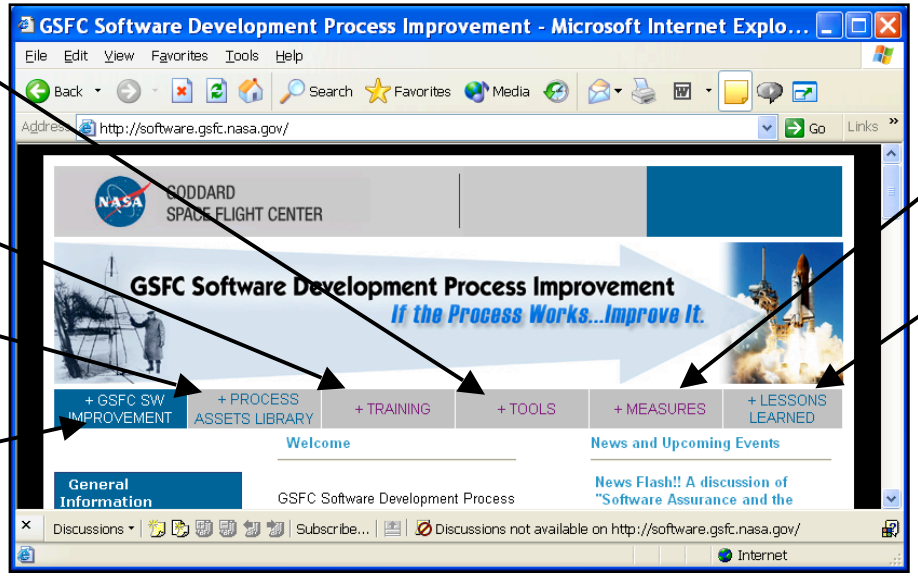
August 2005 – Using the website http://software.gsfc.nasa.gov/

Find tools

Locate training and experts

Use approved process assets

See Engineering process group (EPG) Contacts



Get measurement info

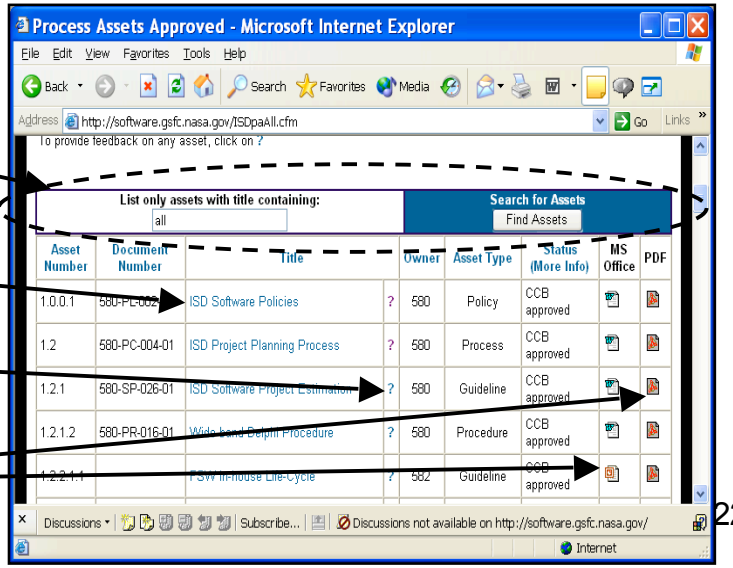
See lessons learned

Use search function to find assets

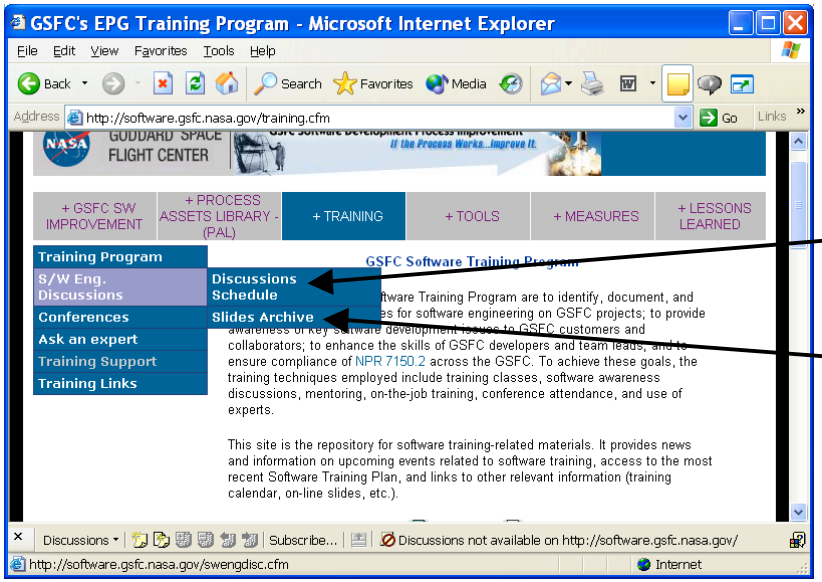
Click asset name to get asset PDF

Click "?" to get feedback form

Click icons for desired files



August 2005 – Accessing Presentation Slides From the Website



For SW Engineering Discussions …
Click "Training" and highlight
"*S/W Eng. Discussions*"

Access SW Engineering Discussion schedule:
(http://software.gsfc.nasa.gov/swengdisc.cfm)

Access slides from past SW Engineering Discussions:
(http://software.gsfc.nasa.gov/swengdisc.cfm)

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Click "Training" and highlight
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Access slides from multiple NASA centers